IN THE

Supreme Court of the United States

OCTOBER TERM, 1943.

No. 392

UNIVERSAL OIL PRODUCTS COMPANY,
A CORPORATION,
Petitioner,

vs.

GLOBE OIL & REFINING COMPANY, A CORPORATION,
Respondent.

REPLY BRIEF OF RESPONDENT.

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Pursuant to leave of this Court granted at the argument of the case held on Friday, March 3, 1944, respondent will undertake to answer in this Reply Brief matters raised for the first time in "Petitioner's Reply Brief" (served on March 2nd) and not already dealt with in our brief heretofore filed. We ask that it be understood that in following this plan, any failure to reply to petitioner's charges of error in no wise indicates acquiescence on our part in the soundness of such charges, for we stand firmly on the allegations of fact and on the principles of law set forth in our opening Brief.

The Dubbs Patent Has Never Been Asserted as an Anticipation Against Behimer.—In referring to the Tenth Circuit cases entitled *The Texas Company* v. *Anderson-Prichard Refining Company*, 32 Fed. Supp. 347 (affirmed 122 F. (2d) 829), petitioner says (Rep. Br. pp. 7-10) that in those cases the defendant's counsel, who are also coun-

sel for the respondent herein, "successfully asserted Dubbs as a defense against Behimer" (Rep. Br. p. 10), thus conveying the impression that in the *Anderson-Prichard* case the defendant sought to anticipate Behimer on the disclosure of the Dubbs patent here in suit, in the same manner as respondent now asserts invalidity of Dubbs on the disclosure of the Behimer application filed on November 21, 1918. Such is not the fact, as petitioner well knows. In the Tenth Circuit litigation, the defendant successfully contended that because Behimer, after becoming involved in interference with all the claims (save claim 6) of the issued Dubbs patent now in suit, finally filed a disclaimer of the counts of that interference and amended other claims of his application to include the element of pump return of reflux, therefore Behimer had abandoned the subject matter disclaimed, *i. e.*, the steps of residue withdrawal and reflux return to the coil inlet, as patentable elements of his claims, and as Judge Kennedy said (Pet. Rep. Br. p. 7) "accepted in lieu thereof the element of its [clean circulation's] use through a pump or mechanically applied pressure." Judge Kennedy's finding in this respect was confirmed by the Court of Appeals, as appears from paragraphs 7 to 10 inclusive of Judge Phillips' opinion (122 F. (2d) 829, at pages 841-2). The defendant in the *Anderson-Prichard* case never contended that Dubbs was earlier than Behimer, or anticipated him, and the courts did not so hold. Thus, petitioner's statement (Rep. Br. p. 8) that "the respondent in this case, in calling Dearborn* and otherwise, took precisely the

* Petitioner, by this statement and by a further statement that Mr. Dearborn "came forward as a witness for the defendant" seeks to convey the impression of volunteered assistance by Mr. Dearborn in the case at bar. As a matter of fact, Mr. Dearborn testified in obedience to a subpoena issued and served upon him (I. 182).

opposite position to that which it took in the *Anderson-Prichard* case * * *" is wholly erroneous. Furthermore, respondent was not a party to the *Anderson-Prichard* case.

Petitioner's Errors of Fact and Law With Regard to the Unclean Hands Issue.—Petitioner asserts (Rep. Br. p. 22) that before leaving The Texas Company's employ Behimer's salary was $15,000.00 per year. This is an error, as petitioner's counsel pointed out at the argument. Behimer's salary with The Texas Company was $10,000.00 per year, and when he accepted employment with Universal his basic salary was increased to $15,000.00 a year, plus a guaranteed minimum bonus of $5,000.00 a year for the first five years, and $10,000.00 a year for the next five years, making a total of $225,000.00 to be paid to him over a period of ten years. Over the same period of time (unless his salary should have been increased) he would have received from The Texas Company the sum of $100,000.00.

Petitioner asserts as a fact that "neither Dubbs nor Universal gave authority to Wannack or anyone else to engage in any improper practices or to make any effort to break into the offices of The Texas Company" citing Dubbs's testimony at Volume I, page 397 of the record in support of the assertion. However, Dubbs admitted (I, 397-8) that he met with his investigator, Wannack, and with Morris Beyt and G. H. Brunow, Texas Company employees, at Beaumont, Texas, on January 29, 1926. The purpose of this meeting was to satisfy Beyt that Wannack had authority to act on behalf of Universal (I, 252). Both Wannack and Brunow testified (I, 253, 110-1) that Dubbs then considered the possibilities and dangers of obtaining copies of The Texas Company records from its files. Dubbs's denial (I, 398) of any such conversation is completely refuted by the affidavits prepared for Universal's benefit, one for Brunow

and signed by him on March 11, 1926, and one for Beyt, but never signed. Both affidavits state that the subject of obtaining copies of The Texas Company records was discussed with Dubbs (V, 2244-5, 2257). The further self-serving statement in the affidavits that Dubbs said he was content with affidavits, may be disregarded in view of the fact that Dubbs admitted receiving from Wannack certain photographs of Texas Company records, and that these photographs had never been returned to The Texas Company (I, 424). That Dubbs knew of the nature of Wannack's employment is further indicated by the undisputed facts that Dubbs and Wannack corresponded under assumed names; that Wannack's expense money, amounting to over $13,000.00, was sent to him in cash; and that Wannack's expense accounts, as well as the telegrams and correspondence with Dubbs, show frequent trips by Wannack to Chicago for conferences, as well as meetings with Dubbs in other places.

Petitioner also states that "upon discovery that Wannack had taken it upon himself to engage in any but proper methods of investigation, he was immediately removed by Dubbs from his position as investigator, and was given notice of discharge by the company." The reference (I, 400-1) is again to the testimony of Carbon P. Dubbs. However, it cannot be denied that after Dubbs had learned of the key episode he sent Wannack east to work with Olsen (another Universal "investigator") for a short time on a related matter (I, 255), and that Wannack then returned to Beaumont and stayed there for a substantial period during which he continued to work on the "investigation." An exchange of telegrams between Dubbs and Wannack, dated August 9, 1926 (V, 2357, 2375) refers to Wannack's "seeing Ward," who had assisted in the Behimer investigation, and

Wannack's letter to White, bearing Olsen's New York address on the envelope, and dated August 27, 1926 (DX. 203, V, 2167-2168) shows that as of that time (after Dubbs's knowledge of the key episode) Wannack was still engaged in endeavoring to secure affidavits and to interview witnesses. That Dubbs knew of Wannack's continued activity on the investigation is apparent from Wannack's wire of August 23, 1926, addressed to "Egeler" (Dubbs's alias) stating that Wannack had returned to "old field." His expense accounts for August and September, 1926 (V, 2321-2) show payment for a hotel room in Beaumont, Texas, from August 20 to September 17, and also list a retainer of $75.00 to Ward, $200.00 to Brunow, and $100.00 expenses to Brunow and Vallie Coons,—all of them employees of The Texas Company who were supposed to know about Behimer's early work. Wannack did not leave Universal's employ until the fall of 1927 (I, 259).

Regardless of what view the District Court must have taken of Dubbs's honesty, he is, on this record, a discredited witness by reason of the fact that on December 2, 1931, after he knew of, and claims to have been horrified by, Wannack's tactics, he executed an affidavit (DX. 248, I, 435-6) extolling Wannack's character in a manner that Dubbs must have then known to be wholly false.

Petitioner asserts (Rep. Br. p. 21) that throughout the "investigation" its sole purpose was to ascertain the truth. This is clearly refuted by a letter written by Morris Beyt on September 7, 1926, to sever his relationship with Wannack. In this letter Beyt stated (DX. 202, I, 218):

> "• • • I have declined to make the affidavit which you left • • • for me to sign • • • the affidavit does not contain the truth in a great many substantial and material particulars. • • •."

Petitioner asserts (Rep. Br. p. 26) that within two weeks after returning from his vacation Behimer had a conference with The Texas Company patent attorney, Dearborn, "and that thereafter he executed all documents which were properly submitted for his signature." This is not true, for he refused to sign the amended preliminary statement in Interference No. 55610 (Respondent's opening Brief, p. 16).

Petitioner asserts as a matter of law (Rep. Br. pp. 29-33) that it cannot be held guilty of unclean hands in the case at bar as the result of what occurred between it and the Texas Company in the interferences. We submit that the governing authority is *Keystone Driller Co. v. General Excavator Co.*, 290 U. S. 240, where the facts were that when about to file an earlier suit against Byers Machine Company, the Keystone Company, having learned of a possible prior use by one Clutter of the subject matter of one of its patents, obtained from Clutter, for valuable considerations, an affidavit to the effect that his work was an abandoned experiment, and also an agreement by him to suppress, so far as he was able, the evidence regarding this work. The Keystone Company prevailed in its suit against the Byers Machine Company, and used the decree therein as a basis for a motion for preliminary injunction in its subsequent suit against the General Excavator Company. These facts present a remarkable parallel to those in the case at bar. In the Dubbs-Behimer interference Universal used improper means to interfere with and suppress the free and full elucidation of facts by unprejudiced witnesses regarding prior invention by Behimer and, having prevailed in the interference, successfully asserted its patent against the Root Refining Company in the Third Circuit litigation wherein the Behimer defense was not

raised. Thereafter, petitioner used the decree recovered in the *Root* case as a precedent against this respondent in the Seventh Circuit* and as a basis for the contention that the *Root* decree was *res adjudicata* as to respondent.

In the *General Excavator* case all the facts regarding the Clutter prior use were fully developed, just as in the case at bar all the facts regarding Behimer's early work were fully adduced. Indeed, the only real difference is that in the *General Excavator* case it was conceded that the Clutter prior use was an abandoned experiment, whereas in the case at bar not only is there no such concession, but the Behimer application is relied on as an anticipation of the Dubbs patent.

Neither in the Wannack investigation nor in the hiring of Behimer was there any genuine effort to ascertain the truth. The attempt was rather to shape the truth to petitioner's ends. The affidavit which petitioner's agents sought to get Behimer's confidential clerk, Beyt, to sign, did not, on Beyt's own contemporaneous statement, "contain the truth in a great many substantial and material particulars" (I, 218), and in hiring Behimer, Universal did not merely want to hire another chemist. Rather it sought to cripple its adversary by getting the rival inventor to change his allegiance, and to color any testimony he might subsequently give regarding his early experiments, as shown by the tenor of the affidavit which it immediately obtained from Behimer setting forth only the "adverse side" of his early work (I, 318).

* It still relies upon the Court of Appeals' decision even in this Court—see petitioner's opening Brief, pages 113-4—although in its Reply Brief (footnote, p. 10) it seems to disavow any advantage from that decree.

500 Pounds Pressure May be Legitimately Used if Necessary to Prevent Substantial Vaporization in the B Tubes.—Although agreeing that before Dubbs's advent it was well known that vaporization could be decreased or prevented by increasing the pressure (footnote Rep. Br. p. 34), petitioner seems to infer that the use of pressure of the order of 500, 850 or 2000 pounds would be outside the teachings of the Dubbs patent.* Indeed, it says that the use of 500 pounds is an unwarranted departure from the conditions of the illustrative run. In taking this position petitioner has apparently forgotten that in respondent's operation the oil enters the high temperature furnace under a pressure of 660 pounds and leaves under a pressure of 500 pounds, the decrease being, of course, due to the frictional resistance in the coil (see diagram opposite page 57 of our opening Brief). If 500 pounds pressure in the coil is a departure from Dubbs, then on this score alone respondent does not infringe the Dubbs patent. If the use of such a pressure does not in itself take the operation outside the conditions of the patent, then obviously such a pressure, and higher pressures, may be used, if necessary, to carry out the claim, teaching against substantial vaporization in the B tubes.

It is not true that cracking immediately results in vaporization. Under sufficient pressure, "one may crack to a considerable degree without substantial vaporization" (Smith, III, 1086). The oil in respondent's cracking coil is cracked to the extent that the stream contains six or seven per cent gasoline before any vaporization begins (Smith, III, 1124).

Petitioner's Expert Was Not Considering a Hypothetical Case When He Stated That One C Tube Would Be Sufficient to Effect Liberation of Vapors From Liquid.—Petitioner challenges respondent's assertion that petitioner's ex-

* In Dubbs's patent No. 1,686,654 (VII, 3470, 3473), the pressure given is from 0 to 1000 pounds per square inch.

pert conceded that if liberation of vapors were the function of the C tubes, one tube alone would be sufficient. Petitioner says (Rep. Br. p. 38) that Dr. Brown was merely considering "a hypothetical case" where separation alone would take place in the C tubes. Such is not the fact. Dr. Brown was testifying to the actual Dubbs operation as he understood it. He said (II, 750):

> "In the Dubbs operation the oil, as it leaves the B tubes goes through the transfer line, comes up into the C tubes from the bottom. If there was any vapor in this transfer line when it was fed with the liquid into this C tube I think the vapors would separate from the liquid very rapidly, within a very few feet or so of that point, anyway, of where that pipe entered the C tube.
>
> "The purpose, under those circumstances, of the remainder of these four C tubes, is, as stated in the patent, additional vapors were generated in the C tubes by a continuation of the cracking reaction dependent upon the heat which the oil has received in going through the B tubes, *so that it is substantially correct that the greater part of these C tubes are provided so that you would get cracking in the C tubes.*" (Emphasis ours.)

Petitioner's Expert Was Unable to State How "Clean Circulation" Solved the Carbon Problem and Petitioner Is in the Same Dilemma.—It is noticeable that neither in its opening Brief nor at the argument, nor in its Reply Brief has petitioner undertaken to explain to this Court the advantages of what it terms "clean circulation," nor how that so-called principle solved the carbon problem. On page 39 of its Reply Brief petitioner says that its expert, Dr. Brown,

> "• • • referred to the many advantages of • • • 'clean circulation' as contrasted with the return of the reflux to a vaporizing and cracking cham-

ber, and described how such 'clean circulation' was responsible for the solution of the carbon problem * * * *"

At the trial petitioner's expert claimed several advantages from the return of reflux to the inlet of the coil or B tubes rather than to the C tubes or reaction chamber. He said (II, 709), that by so doing (1) it becomes practical to operate at a low cracking per pass and still obtain high yields, (2) the solvent action of the reflux retards the formation of carbonaceous material, (3) it acts as a diluent of this material, and (4) heat is saved which would otherwise be lost in cooling the reflux and again bringing it up to temperature. However, Dr. Brown had to admit, on cross-examination (II, 713), that all these advantages, save that of heat conservation, would be present in a once-through operation where the reflux is taken out and mixed with the raw charging stock instead of being returned immediately in a cyclic process.

What petitioner terms "clean circulation" is, in reality, merely the return of the reflux to the B tubes rather than to the C tubes, but whichever way it goes has no effect upon the carbon problem, nor does the Dubbs patent make any claim that it has. Petitioner repeatedly asserts (*e. g.*, Rep. Br. p. 40) some virtue in the fact that by returning it to the coil inlet, the reflux is prevented from mixing with the carbonaceous residue in the C tubes or reaction chamber. This is entirely wrong. It is quite apparent that in any event the reflux always mixes with the residual oil in the C tubes or reaction chamber, and it makes no difference whatsoever, so far as the carbon problem is concerned, whether the reflux reaches the C tubes by a short cut directly from the dephlegmator or whether it reaches them by the longer route via the B tubes. The reason for the specific instruc-

tion in the Dubbs patent (VII, 3090, lines 28-31) that the reflux condensate

> "• • • in all cases is trapped off from the vapor lines in such manner as to prevent their [*sic*] returning direct to the vaporizing tubes C"

is that, being cooler than the oil in the C tubes, the reflux would tend to lower the temperature therein if returned directly, thereby tending to defeat Dubbs's intention to maintain cracking conditions in these tubes.

In respondent's operation the sole advantage, and that a slight one, of returning the reflux directly to the inlet of the coil, is the conservation of heat which would otherwise be lost were the effluent from respondent's bubble tower drawn off to storage tanks, allowed to cool, and then charged to the inlet of its cracking coil. There is also, of course, the saving of such equipment as storage tanks and pipes (III, 1131-2). Respondent, in contrast to Dubbs, deliberately cools the stream before it enters the vapor separator in order to stop cracking in the very step where Dubbs promotes it.

In respondent's operation reflux return to the coil inlet has no effect on the carbon problem (Smith, III, 1132).

Obviously the withdrawal and nonreturn of residue cannot be relied on as a novel element in Dubbs, for it was very well known in the prior art, and Dubbs was refused a patent with this concept as the vitalizing feature.

The Holmes-Manley Stills Without Clean Circulation Were an Improvement on Burton and Did Solve the Carbon Problem.—On pages 39-40 of its Reply Brief, petitioner asserts* that the commercial operation of the Holmes-Manley

* The record reference given by petitioner at line 12, page 40, of its Reply Brief should be to Volume VI, rather than to Volume IV of the Record.

stills without clean circulation (*i. e.*, with continuous residue withdrawal and nonreturn, but with reflux return to the still instead of to the coil inlet) was "little better than the Burton-Clark procedure." Petitioner's statement is based, however, upon operating data of an experimental run of Battery 3 of Experiment No. 18 (DX.'s 705, 707, VI, 2677-9, 2685), and not upon the commercial operations* of The Texas Company. Furthermore, petitioner arbitrarily adopts the single factor of length of run as the criterion of a successful and profitable operation.

Petitioner would have it appear that increased "length of run" is attributable to the change in the manner of returning reflux in the Holmes-Manley stills. The Texas Company's records show that this is not so. Thus, Run 3 of Battery 4 of Experiment No. 18, the pilot plant and forerunner (II, 921) of the commercial Holmes-Manley operations, had an on stream period of 64 hours, almost twice as long as Burton's, whereas Run 63 of Battery 14, which was selected by Behimer as a typical run, made six months after incorporation of the Dow Surge Pump to return reflux to the coil ("clean circulation"), was started October 31, 1921, and ended November 3, 1921, which, allowing for bringing up and closing down periods, leaves no more than approximately 60 hours for the on stream period. The conditions noted on Defendant's Exhibit 732 (VI, 2727) are the averages for the last 50 to 55 hours under operating conditions (II, 932). The 500-hour runs mentioned by petitioner (Rep. Br. p. 40) oc-

* Battery 3 of Experiment No. 18 comprised a preheater coil and a *single* vertical still (II, 918), whereas the Holmes-Manley commercial battery comprised a preheater and *four* vertical stills (DX. 729, VI, 2721). Hence, Battery 4 of Experiment No. 18 (a preheater and four stills) is more representative of the commercial batteries (II, 921).

curred in 1924, three years after the Holmes-Manley stills had been in operation at The Texas Company's plant (I, 490-1).

Howard V. Smith testified, without contradiction, that length of run is not the sole criterion of the commercial value of a process; that investment and operating costs, type of material, whether expensive or cheap,* which could be charged, and the quality and yield of product, all enter into the question (III, 1135). Moreover, later engineering developments such as better fractionators, improved furnace design, better materials and equipment, and more efficient and accurate gauges and meters (II, 1287-8), all undoubtedly contributed to the increased length of runs.

The carbon problem was solved in the Holmes-Manley stills in the same way it is solved in the Dubbs patent, not by "clean circulation," but by imparting the cracking heat in the coil and doing the major part of the cracking, with the consequent deposit of carbon, in an unheated or lightly fired drum where carbon in large quantities could be deposited without harm. This was true of the Holmes-Manley stills both before, and after, they were equipped with hot oil pumps to return reflux to the coil inlet.

In the operation of the Holmes-Manley stills, the carbon-containing residue was always withdrawn and was never circulated through the coil. This feature likewise was practiced when, before the installation of the reflux pumps, reflux was returned to the still, instead of to the coil inlet.

* It was always Universal's boast (V, 2333-2403) that even the dirtiest and cheapest stocks such as fuel oil or "refinery slops" (V, 2394) could be charged to the Dubbs cracking unit, but in charging such stocks the runs did not average more than three days on stream (VI, 2978-84).

Petitioner's Attempted Evasion of the File Wrapper Estoppel.—At pages 47-50 of its Reply Brief, petitioner seeks to avoid the effect of the file wrapper estoppel discussed at pages 48-52, and 95-97 of respondent's opening Brief, by asserting (1) that Dubbs's claims 4 and 5 are not dirty circulation claims, and (2) that the "remarks" of Dubbs's solicitor accompanying the submission of the final claims show that he was still insisting on the "clean circulation" feature to distinguish the Dubbs process from the references on which the previous claims had been rejected, and that, consequently, the limitation against vaporization (without which the claims stood rejected) cannot have the effect contended for by respondent.

As its first point, petitioner says (Rep. Br. pp. 48-9) that Dubbs's claims 4 and 5, submitted for the first time in the final amendment, are clean, and not dirty, circulation claims, because they call for "a stream in an advancing direction" which petitioner says is present in Dubbs and not present in the references.

The "advancing stream" is as present in Trumble as in Dubbs. Dubbs contemplates a gasoline making process comprising a stream advancing from its inlet as oil to its outlet as gasoline (pressure distillate). True, in Trumble, the reflux comes back and goes around again,—but so it does in Dubbs. True, in Trumble, the advancing stream is continually bled of a part of the residue,—but so it is in Dubbs (by claim 4,—by claim 5 this bleeding is not even called for at all).

Obviously, an "advancing stream" has nothing to do with the question of whether the reflux is contaminated by residue. Both Dubbs's claims 4 and 5 read squarely on Trumble's process if "vaporization" be given petitioner's

meaning, because neither claim calls for reflux uncontaminated with residue. If given respondent's meaning, these claims differentiate from Trumble, but not with respect to residue withdrawal, for as to this they are broader than any claims theretofore submitted by Dubbs. That is why claims 4 and 5 were drawn. It is the ground on which they differentiated from such a claim as 7. It is absurd to contend that the patent solicitor was seeking in claims 4 and 5 to cover precisely the same ground as in claim 7.

It is not possible to conceive of the Dubbs process as being an "advancing stream" and of Trumble as not being an "advancing stream." In this respect, they are alike. Not only is this obvious, *but it was expressly pointed out to Dubbs by the Office in its letter of July 28* (IV, 1535), *that Trumble "continuously passes oil in one direction," and Dubbs acquiesced.* It is now too late for petitioner to assert such distinctions.

Petitioner also relies (Rep. Br., p. 48) on the language of claim 5 which says that the stream of oil is passed from an inlet point to a discharge point "separated and entirely disassociated from the inlet point." Petitioner contends that this language "definitely excludes the return of any residue from the C tubes to the inlet of the B tubes." Obviously it does no such thing. It reads squarely on a process such as Trumble's, where the stream is taken off and condensed as product. Even if the "discharge point" should be assumed to be the residue withdrawal line from the C tubes, there is nothing in claim 5 which requires, as does claim 7, for example, "preventing it [the residue] from returning to the cracking zone. * * *"

That claim 5 is, as we contend, a "dirty circulation"

claim is confirmed by the fact that petitioner itself was formerly of this view. In the Dubbs-Behimer Interference No. 49,355, wherein the issue counts were all the claims, save claim 6, of the Dubbs patent, petitioner said, through one of the same counsel who subscribe its briefs before this Court, that (DX. 178, V, 2078):

> "The broader counts of this interference, of which count 5 [claim 5] may be taken as an example, involve a treatment of hydrocarbon oil characterized by the heating of the oil to a cracking temperature, during its passage from an inlet point to a remote discharge point, without effecting material disassociation of the molecular structure of the oil,* then causing the oil in its passage to enter a zone where substantial vaporization takes place, then taking off the vapors from the zone where vaporization occurs and condensing the heavier portions thereof, and returning this condensate to the oil stream so that it will be again subjected to the cracking temperature; the whole being conducted under the pressure of the generated vapors.
>
> "*Some of the counts specify that, in addition to the foregoing, the carbon-containing residuum shall be discharged without any substantial portion thereof intermingling with the oil which is in, or to be passed through, the heating zone.*" (Emphasis ours.)

This clearly shows petitioner's *ante litem motam* understanding that claim 5 of its patent (Count 5 of the interference) was *not* a claim calling for residue withdrawal and nonreturn, and was, therefore, broader in this respect than other claims which did so call.

As to petitioner's second point, we submit that it cannot be the law that the limiting effect of a narrowing

* That is, without substantial cracking. It will be observed that petitioner was then of the same opinion as the District Court and respondent,—namely, that in the Dubbs process material cracking does not occur in the B tubes.

amendment to patent claims can be nullified by "remarks" accompanying the amendment. Otherwise, any amendment could be neutralized and the claims be left with the same scope and meaning after, as before, the amendment, merely by accompanying the amendment with the "remark" that no change had been made in the claims, and that their meaning remained the same as before. The attempted use of such file wrapper arguments was condemned by the Court of Appeals for the Seventh Circuit in *Bassick Co.* v. *Faultless Caster Corporation*, 105 F. (2d) 228, where the Court, in referring to *Spalding* v. *Wanamaker*, 256 Fed. 530 (C. C. A. 2), said (p. 231):

> "* * * That case and similar cases go to the proposition that the terms of a claim should not be limited or extended by mere extraneous remarks of the applicant in argument without an actual amendment of the claim to that effect. Whether the established rule is contrary to this principle is beside the point now before us, for appellee is not here asking that its claim be limited but, on the other hand, it is asking that it be not so limited. Under these circumstances, we shall not consider the applicant's argument to the Commissioner for the purpose of now changing the plain wording of his claim. * * *"

Petitioner concludes its section on the file wrapper estoppel with the contention (Rep. Br. p. 50) that even though Dubbs's claims 4 and 5 do not distinguish from Trumble or Edwards, the only effect would be their invalidity, because broader than Dubbs's invention. Petitioner cannot so easily escape from its dilemma. The validity of these claims is not in issue on this aspect of the case. Even though invalid, they show clearly that Dubbs used "vaporization" in its accepted sense in these two claims, for otherwise they do not distinguish from Trumble, and if "vaporization" in claims 4 and 5 means, as it

must, the generation or formation of vapor from liquid, then the word must mean the same in every other claim, and respondent does not infringe.

Petitioner Has Not Ascribed any Intelligible Meaning for the Word "Substantial" as Used in Dubbs's Claims if "Vaporization" be Given Its Meaning.—The first full paragraph on page 51 of petitioner's Reply Brief fails to throw any light at all on the use of the word "substantial" in Dubbs's claims.

Petitioner asserts that the word "substantial" (bottom paragraph, p. 51) indicates a point "when, momentarily, there might be a slight release of vapor from the foam," and the record reference (II, 699) is to Dr. Brown's testimony on this point. A reading of that testimony discloses that Brown fairly conclusively demonstrated that in his asserted meaning of the word "vaporization" the word "substantial" became meaningless, and in fact that the whole clause indicated a condition of such vagueness and confusion as would necessarily result in the invalidity of the claims. Immediately following upon the testimony cited by petitioner (II, 699), the District Court took a hand in questioning Dr. Brown on the meaning of "substantial." The Court asked (II, 700):

> "Just to clear up, I suppose when there is separation, there is separation. There isn't any such thing as a dividing line between substantial and unsubstantial separation? Would you mean that separation substantially or insubstantially would be in the amount of what? Separation would be separation or it would not, wouldn't it?".

Dr. Brown's answer spoke volumes (II, 700):

> "There is a sort of twilight zone where perhaps scientists may be on a ground for debate."

There is no "twilight zone" giving "ground for debate" (and, hence, also giving ground for holding the patent invalid for lack of certainty) if an ordinary English word, used in the patent, be given its plain meaning.

Behimer's Early Experimental Work Was Successful and Was Regarded as Successful at the Time.—Petitioner contends that the anticipating effect of Behimer's application filed on November 21, 1918, must stand or fall with the success or failure of Behimer's experimental work upon which this application was based. We deny the validity of this premise, and we have shown in our opening Brief (pp. 77-82, 132-6) that Behimer's application discloses all the process steps of the Dubbs patent and, in any event, constitutes prior art, which, in view of the availability of the hot oil pump or Pielsticker's supply tank prior to Dubbs's filing date, negatives patentability in Dubbs.

In the lower court the reason that full proofs were adduced by the respondent regarding Behimer's conception and actual reduction to practice in 1916 and 1917 was that it was not then known whether petitioner would endeavor to carry back the date of Dubbs's invention. Petitioner subsequently attempted to do so, not by calling Dubbs, or any other fact witness, but by having its expert witness, Dr. Brown (III, 1416-36; 1466-96), try to find a suitable disclosure in an abandoned Dubbs application filed in 1917 (IV, 1891). This attempt was unsuccessful in the court below, was wholly abandoned on appeal, and has not been renewed before this Court. Thus, while there was no occasion to refer in our opening Brief to Behimer's early work, it becomes necessary to do so now in order to refute petitioner's Reply Brief charge that this work was "sterile and abortive."

The operating data and results of several runs, conducted by Behimer in 1917, under the name of "Experiment 8," were fully and accurately recorded (DX.'s 676-680, VI, 2499-2615), according to the usual practice of The Texas Company, and were reported contemporaneously by Detwiler and Behimer. These reports, and the operating data therein, have never been challenged by petitioner. The operation conducted in these runs (II, 887-8, 898-900) was the same as the operation described in the application as filed.

Run 6 (DX. 676, VI, 2499) was conducted from May 30, 1917, until June 1, 1917. The overall running time (including starting up and shutting down) was 50¼ hours. During the run, 1259 gallons of paraffin base gas oil of a gravity of 37.5° were charged to the unit. The average pressure maintained in the system was 200 pounds, and the average temperature of the oil in the last tube of the coil was 825° (II, 899). A pressure distillate was obtained of 51.7° gravity in the amount of 363.72 gallons, or 28.88%, of the fresh charge (II, 903). This distillate had an initial boiling point of 121° and 60% thereof was driven off at 394°. The overall yield of gasoline in the run as computed at that time was 16.66% (II, 904), not including losses by way of samples and evaporation of about 3% additional gasoline (II, 941).

Run 9, which repeated the operating conditions of Run 6, was conducted from June 26, 1917, to June 29, 1917. The overall running time was 54¾ hours. During the run, 1324 gallons of paraffin base gas oil of a gravity of 38° were charged to the unit. The average pressure maintained on the system was 200 to 225 pounds, and the average temperature of the oil in the last coil was 25° higher than in Run 6, or 850° (II, 900). In this run, Behimer

produced a pressure distillate of 51.8 gravity in the amount of 435.75 gallons, or 32.91% of the fresh charge (II, 905). The overall yield of gasoline in the run was 18.54% (II, 905, 943), not including 3% for losses.*

As to these runs, Behimer testified that he wanted to force the backtrap (reflux) continuously through the coil as it was formed, and *that his system did that uniformly* (II, 902); that the jet had to work or else the system would "puke" and contaminate the distillate (II, 888, 889), and that at no time did the apparatus "puke" (II, 889). He stated (II, 899):

> "The best evidence that the backtrap was forced into the heating coil was whether the backtrap line was hot, and the next evidence, the color of the distillate. As far as I know the backtrap line was hot and the distillate was never off-color."

Detwiler also so testified (II, 1009).

The foregoing establishes that between May 30, 1917, and June 29, 1917, Behimer employed the series of steps comprising the process here in issue in apparatus corresponding to that shown in his application (including a jet), that he satisfactorily demonstrated the process, and that he attained his desired object of producing a satisfactory yield of gasoline. Behimer testified that his yield of 21% on the charge, was very good for that period (II, 943).

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* On page 67 of its Reply Brief, petitioner says that the failure of runs 10 and 11, using a kerosene charging stock, "sounded" the "death knell" of Behimer's Experiment 8. This is contrary to the fact. The failure to make gasoline with a kerosene stock was wholly due to the inability of the crude apparatus to withstand the high pressure (300 lbs.) needed to prevent vaporization of this light material before a cracking temperature was reached, thus resulting in the escape of the kerosene from the drum, in vapor form, before it could be cracked (II, 906-7; 944).

We here note that in 1919, two years after Behimer's runs were conducted, Universal, in connection with the issuance of a license to the Shell companies, guaranteed a gasoline yield of only 21 per cent, based on a gas oil charging stock (IV, 1737). If this yield was good enough for Shell, it would seem to be good enough to show a satisfactory yield in Behimer's runs.

Subsequently, Behimer endeavored to embody his process in large scale semi-commercial operations, and he then found that jets following the design of that which had been operated satisfactorily in the small apparatus of Experiment 8 were unsuitable. This was due to the larger capacity of the apparatus, and to the increased frictional resistance (II, 918, 919) in the *two-inch* coil, 1500 feet in length, then being used (II, 917). However, the unsuitability of the jet in large-scale apparatus did not, as petitioner contends, cause the abandonment of Behimer's work. The Texas Company caused an application for patent to be filed, which, in itself, negatives abandonment (*United Chromium, Inc.* v. *General Motors Corp.*, C. C. A. 2, 85 F. (2d) 577 at 579) and continued its efforts to find a suitable pump (although never thinking to look in the right place —in the Patent Office—where the Thompson pump had been revealed to the public in December, 1917), and when such a pump was at length brought to Behimer's attention, it was installed on the commercial batteries of Holmes-Manley stills which had been erected with special provision for the installation of pumps as soon as a suitable one should be found (II, 923-4; 967-8). The impression which petitioner seems to wish to convey that the Holmes-Manley stills erected at a cost of $3,000,000.00, represented wasted capital, is wholly erroneous. These

stills continued to function successfully and profitably with clean circulation just as they had previously without it.

The case of *Curtis Aeroplane & Motor Corporation, et al.* v. *Janin, et al.*, 278 Fed. 454 (C. C. A. 2), appearing in the quotation from the District Court's opinion at page 74 of petitioner's Reply Brief, has no application to the facts in the case at bar. In the *Curtis* case Janin's application for a hydro-aeroplane disclosed only a boat-shaped body which, in the language of the Court, "could never be lifted from the water by any power compatible with flying and placed in a flying machine." In other words, Janin's disclosure was completely inoperative. This case would only be pertinent as against Behimer if the jet disclosed by Behimer had not functioned at all in Experiment 8, and, hence, that the process disclosed in Behimer's application could not be performed at all with the apparatus disclosed.

If the Invention Resides in the Sufficient Elevation of the Dephlegmator in Commercial Operations, Then the Dubbs Patent Is Invalid, for It Contains No Such Disclosure.—In seeking to disparage Behimer as an anticipation of Dubbs, petitioner makes the extraordinary claim that Dubbs succeeded and Behimer failed, because Dubbs (Rep. Br. p. 72)

> "• • • supplied the spark of genius, making the clean circulation process possible by utilizing a high hydrostatic head for imposing upon the hot volatile reflux the necessary pressure to insure passage through the elongated cracking tubes against the frictional resistance developed therein."

Petitioner contrasts this "revolutionary invention" which went into commercial use "on an enormous scale" with Behimer's "unworkable jet."

We have here an admission that the thing which made the clean circulation process work in commercial operations was the great elevation of the dephlegmator, as shown in the model produced in court at the argument, and as shown also on plate 7 of the petitioner's "Supplement" to its opening Brief.

If this was indeed the "spark of genius" necessary to make the invention work, then the Dubbs patent is wholly invalid, for it contains no hint whatsoever either of the problem, or of its solution by utilizing a "high hydrostatic head."

As a matter of fact, of course, petitioner is wrong, and Dubbs and Behimer were right. The drawings in the Dubbs and the Behimer patents show an elevated dephlegmator. Neither patentee thought it necessary to teach the obvious fact, well known to the art, that the height of the dephlegmator could be increased if necessary to overcome resistance in a longer length of coil.

In claiming for Dubbs the "spark of genius" in "utilizing a high hydrostatic head" petitioner is again at odds with its own expert, for Dr. Brown testified (III, 1484-5) that the elevation of a vessel containing liquid "perhaps 20 feet in the air or 25 feet in the air" would have been an obvious expedient in 1917 for overcoming frictional resistance in a pipe.*

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* Dr. Brown was then endeavoring to aid petitioner in carrying back Dubbs's date to the 1917 application, and on being pressed as to the availability of a pump as of that time to pump hot vapors, he stated that the lack of availability of such a pump would not make Dubbs's 1917 disclosure inoperative because, as he said (III, 1484), in referring to the drawing of this 1917 disclosure (IV, 1883):

> "All that would be necessary would be to increase the height of the retorts A-1, A-2, A-3, A-4 and A-5, in reference to the furnaces B-1, B-2, B-3, B-4 and B-5."

Petitioner's further statement (Rep. Br. 72) that the "spark of genius" in greatly elevating the dephlegmator to give an adequate hydrostatic or gravity head resulted in the installation "from 1919 to 1926" of "99 commercial Dubbs cracking units" is calculated to convey the impression of widespread commercial use of Dubbs units in 1919, prior to The Texas Company's equipment of the Holmes-Manley stills with reflux pumps in 1921. As a matter of fact, the only Dubbs operation in 1919 was with the demonstation unit at Independence, Kansas, and in the operation of the first commercial unit at Wood River, known as Roxana No. 1, in the summer of 1921, considerable engineering difficulties were experienced (Pyzel, I, 539), which were not overcome until the No. 1-A unit was put into operation in June, 1922 (II, 603), a year after The Texas Company's Holmes-Manley stills were successfully operating with the hot oil reflux pumps.

Petitioner's Reply Brief Attacks on the Prior Art.—Most of petitioner's arguments with respect to the prior patent art were anticipated in our opening Brief. We deal here only with such points as were not therein mentioned.

On pages 81-2 of its Reply Brief, petitioner again refers to the Trumble patent (VII, 3287) and again claims the advantage for Dubbs in withdrawing all the residue over Trumble's partial withdrawal. This distinction which petitioner calls a "brilliant concept" cannot, of course, refer to Dubbs's claims 4 and 5 which are outright "dirty circulation" claims, nor to claims 1, 2, and 9, which merely prohibit the return of substantial portions of the residue. But in any event petitioner cannot base patentability in Dubbs on the "brilliant concept" of residue withdrawal and nonreturn, for this step was first taught in a continuous process in Benton (British) No. 1922 of 1887 (VII,

3527), and was thereafter taught in the continuous processes of Pielsticker (British 1308 of 1891, U. S. 477,153, VII, 3531, 3126), Hall, 1,175,910 (VII, 3200), Ellis, 1,396,999 (VII, 3352), Manley, 1,428,338 (application filed October 10, 1917, VII, 3382), Alexander, 1,407,619 (application filed February 21, 1917, VII, 3364), Greenstreet, 1,740,691 (application filed August 4, 1917), and the Behimer application filed November 21, 1918 (VI, 2653-69). Petitioner could only contend for invention in Dubbs's total residue withdrawal over Trumble's partial withdrawal if Trumble represented the whole state of the prior art. But total withdrawal and nonreturn of residue was an old story both in *continuous* drum-cracking processes (Behimer's 1918 application and Manley patent No. 1,428,338) and in *continuous* coil-cracking processes (Benton, Pielsticker, Hall, Ellis, Greenstreet, and Alexander) long before Dubbs entered the field.*

On page 85 of its Reply Brief, petitioner refers to the statement in the Hall patent No. 1,175,910 (VII, 3200, pat. p. 2, lines 113-7) about carbon being thrown out in the dephlegmators, and argues therefrom (pp. 85-6) that Hall's reflux would be unsuitable for recycling because contaminated by this carbon.

This contention is untenable, because, *first*, since Hall is a vapor phase operation, the "large quantities" of carbon, referred to in this statement in the Hall patent, would be insignificant as compared with the tons of carbon obtained

* We believe that a possible misapprehension should be corrected because of petitioner's reference to "throwing away" the residue withdrawn in continuous processes. We assume petitioner used such language figuratively. As a matter of fact the residue was re-distilled to make further clean charging stock and even the heaviest tar was frequently used for some purposes, *e. g.*, in road surfacing.

in the process of the "fireless cooker" type (Reiman, III, 1225); *second*, nothing is said about how this carbon is distributed between the first and second dephlegmators, and the greater part of it would be deposited in the first dephlegmator as stated in the '796 Hall patent (VII, 3232, p. 2 lines 40-51; Reiman, III, 1225); and, *third*, some carbon could be deposited in the second dephlegmator without contaminating the condensed reflux withdrawn from the bottom thereof (Reiman, III, 1318-19), this reflux being suitable for direct return to the coil "without filtration or other preliminary treatment" as taught in Hall's '796 patent (VII, 3232, p. 2, lines 40-51).

A small deposit of carbon in the second dephlegmator of the Hall '910 process, in the bubble tower used in respondent's operation, or in the dephlegmator of the Dubbs commercial process, does not affect the cleanliness of the recycle stock sufficiently to make it an unsatisfactory feed for the cracking tubes. Howard V. Smith testified (III, 1130) that some carbon accumulated in the bubble tower of the Winkler-Koch commercial operations, and Hooker, Ede, and Backus (II, 810, 820, 840) each stated that slushy carbon was present in the dephlegmator and reflux leg in the Dubbs commercial operation. Backus stated that carbon was also present in the dephlegmator and reflux leg of the 1919 demonstration unit at Independence, Kansas (II, 831). In no instance was the recycle stock contaminated so as to cause trouble in the coils.

In dealing with the Pielsticker patents petitioner particularly emphasizes a criticism which it directs at the prior art in general, namely, the alleged lack of commercial use of its teachings. This argument really begs the question. It assumes from the admitted lack of commer-

cial operations under the name of Pielsticker or Ellis that the so-called steps of clean circulation are not disclosed in their patents. But, obviously, if the steps are disclosed, then both patents, according to petitioner's proofs, have been used extensively. In any event the patent statutes do not make commercial use a condition precedent to the anticipating effect of a prior art patent or use *Smith* v. *Hall*, 301 U. S. 216, 233; *W. H. Butcher Packing Co.* v. *Cincinnati Butchers' Supply Co.*, 35 F. (2d) 567 (C. C. A. 10).

Petitioner seeks to escape (Rep. Br. p. 99) from its former interpretation of Pielsticker in the *Warner-Quinlan* case, when it agreed with respondent's position, by the assertion (not based on anything in the Record) that its former views were merely "argument of counsel unaided by any testimony." This view is distinctly stultifying to members of the bar, for it seems to lend support to the opinion too often expressed by laymen that lawyers are lacking in intellectual integrity. But in any event, petitioner's argument is too unrealistic to be credible. Even though no expert witness testified in court for petitioner with respect to Pielsticker in the *Warner-Quinlan* case, it is not to be doubted that petitioner's counsel had the benefit, in construing Pielsticker, of the advice of its experts, if expert advice were needed. The change in petitioner's views of Pielsticker is not due to advice or lack of advice from experts, but rather to the change in its status from defendant to plaintiff.

Egloff's Claims Do Not Denote Coil Cracking.—On pages 103 and 104 of its Reply Brief, petitioner seeks to escape the file-wrapper estoppel based on Egloff's choice of the adjective "heated" instead of "cracked" as being properly descriptive of the effluent delivered to the expansion cham-

ber from the coils, by asserting that the claims finally allowed teach cracking in the coils because they recite that the oil in the coils is subjected to "a *cracking* temperature" (emphasis petitioner's). This is a further and glaring instance of petitioner's attempt to blind the Court to the significance of the time factor in cracking. Petitioner repeatedly seeks to convey the impression that when oil is raised to the cracking temperature it immediately cracks—a proposition that is no more true than that a loaf of bread dough immediately becomes baked bread when the dough is inserted in an oven and raised to a baking temperature.

Indeed, the call of Egloff's claims for subjecting the reflux "to a cracking temperature" and "simultaneously heating an independent advancing stream of charging stock to a cracking temperature," so far from being a call for cracking, is, in itself, a strong indication that cracking is not to occur (substantially) because the necessary element of time is not given. And when we consider that it *is* given with respect to the oil in the expansion chamber, the conclusion is inescapable that it is in this chamber, and not in the coils, that the major cracking of the process is intended to occur. The claims all speak of "a process of oil conversion consisting in maintaining a body of heated hydrocarbons in an enlarged zone where substantial vaporization occurs * * *." The words "maintaining a body" of oil clearly denote the time factor, and we know from the specification that, as the oil is delivered to the expansion chamber in its liquid state and as there is no reduction in pressure or increase in temperature in the chamber, the vaporization which occurs therein must be entirely the result of cracking. Thus, the language of Egloff's claims is confirmatory of the file history wherein Egloff made his election and told the Examiner that the effluent from both

coils was delivered to the chamber in a "heated" and not "cracked" condition.

Petitioner further states (Rep. Br. p. 104) that the Examiner "understood that Egloff's reflux was *cracked*, before it reached the expansion chamber." We cannot understand how such a point can be advanced with sincerity. The Examiner used the language quoted by petitioner *in the same letter* (Paper No. 4, IV, 1630-1) in which he called on Egloff to choose between "heated" and "cracked" as the proper description of the oil and reflux in his coils 5 and 6 respectively. Thus, the Examiner, then laboring under a misapprehension, characterized the material as "cracked" *before he had received the answer to his request for clarification.* Upon the receipt of this answer (Paper No 5, IV, 1631-2) in the submission of new claims all of which designated the material as "heated" and not "cracked," neither the Examiner nor the applicant ever thereafter characterized it as "cracked."

The "remarks (Pet. Rep. Br. p. 104) presenting the claims appearing in the patent," as we have already pointed out, cannot possibly alter the effect of an amendment, and in any event there is nothing in the statement that the condensate "is to be heated to a temperature 'necessary for properly cracking' the same" which indicated that the cracking is to occur in the coil. In Egloff, as in Dubbs, the cracking *heat* is to be imparted in the coil and maintained in the chamber where, combined with the time factor, it will cause cracking to take place.

Respectfully submitted,

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SUPREME COURT OF THE UNITED STATES.

No. 392.—October Term, 1943.

Universal Oil Products Company, Petitioner, *vs.* Globe Oil & Refining Company.	On Writ of Certiorari to the United States Circuit Court of Appeals for the Seventh Circuit.

[May 29, 1944.]

Mr. Justice Reed delivered the opinion of the Court.

The petitioner sued the respondent for infringement of United States Patents No. 1,392,629, dated October 4, 1921, and No. 1,537,593, dated May 12, 1925. The former was issued to Carbon P. Dubbs; the latter, to Gustav Egloff. These patents cover the Dubbs process for converting heavy crude oils to lighter oils, especially gasoline. The claimed infringement arises from the respondent's use for the purpose of such conversion of the "Winkler Koch process" in apparatus designed and installed by the Winkler Koch Engineering Company. The district court dismissed the bill on findings of fact to the effect that Patent No. 1,392,629 was valid but not infringed, and that Patent No. 1,537,593 was invalid, without findings on the issue of infringement.[1] The majority of the Circuit Court of Appeals found both patents not infringed and did not pass on their validity; Judge Lindley [redacted] that the Dubbs patent was infringed but that both patents were invalid.[2] The Court of Appeals for the Third Circuit found the same patents to be valid and infringed by the use of a process substantially similar to respondent's in *Root Refining Co.* v. *Universal Oil Products Co.*, 78 F. 2d 991. To resolve the conflict thus presented we granted certiorari, 320 U. S. 730.

was of opinion

Where the questions presented by the contested claims of infringement and validity are purely factual, this Court ordinarily accepts the concurrent conclusions of the district court and Circuit

[1] Universal Oil Products Co. v. Globe Oil & Refining Co., 40 F. Supp. 975.

[2] Universal Oil Products Co. v. Globe Oil & Refining Co., 137 F. 2d 3.

Court of Appeals in these cases. *Goodyear Co.* v. *Ray-O-Vac Co.*, 321 U. S. 275. But in resolving conflicting views of two Circuit Courts of Appeals as to a single patent, we are obliged to undertake an independent reexamination of the factual questions. *Sanitary Refrigerator Co.* v. *Winters*, 280 U. S. 30, 35-6.

The patents and the allegedly infringing process concern commercial methods for converting petroleum, as it is found in nature, into the gasoline in everyday use as motor fuel. The experts who testified in the district court have stated some of the theoretical background of the processes used, and a brief summary of this material may facilitate understanding of the process involved.

Layman and chemist alike are of course familiar with the conception of the atoms of "chemical elements" as the basic building blocks of ordinary chemical compounds.[3] The atoms of the "elements" have the capacity to combine with the atoms of other elements to form the molecules of "chemical compounds," whose properties seem to depend directly upon the nature of the molecule. In the field of oil chemistry, the outstanding fact is the extraordinary ability of carbon and hydrogen to combine with each other into molecules containing widely varying numbers of carbon atoms with different proportions of hydrogen atoms in an almost unlimited number of different structural arrangements. These combinations, generically termed hydrocarbons, are present in great variety in crude oil.

The hydrocarbons differ widely from one another in their physical properties, particularly in the property of volatility, which is of prime importance in motor fuels. As one might expect, the hydrocarbons composed of large molecules with many carbon atoms are heavy, sluggish liquids with relatively high boiling points; they are not suitable for use as gasoline. Those with smaller molecules are much more volatile—indeed, the very smallest are gases at ordinary temperatures.

The initial step in the preparation of gasoline from crude oil involves no molecular change; it consists merely in separating the light hydrocarbons in the natural mixture from the heavy hydrocarbons. This step is accomplished by heating the oil until it vaporizes and then carrying the vapors through a device familiar to industrial chemistry under the name of a fractionating tower.

[3] This case does not require consideration of any theory as to the internal character of the atom.

Such a tower is in effect a series of condensers in which the vapor mixture is cooled and the liquid condensate drawn off in separate steps. First the high boiling point constituents, reaching a liquid phase after relatively little cooling, are condensed and withdrawn; this process is repeated on the remaining constituents in successive steps as the vapors cool, until there remain only those low boiling point hydrocarbons suitable for use as gasoline.

By fractional distillation alone, a typical sample of Mid-Continent crude oil might yield approximately 25% gasoline, 5-7% kerosene, 30% gas oil, and a balance of 38-40% fuel oil. The fraction remaining after the distillation of gasoline or gasoline and kerosene is termed "topped crude."

For many years the commercial petroleum industry carried the production of gasoline from crude oil no farther than this initial step of separating it from the mixture. But with the introduction of the automobile, the demand for gasoline increased rapidly, and it became necessary to develop commercial apparatus for the conversion of heavy hydrocarbon molecules to light hydrocarbon molecules by the chemical process known as "cracking."[4] Chemists had long known that by heating the heavier hydrocarbons to temperatures of the order of 750-900° Fahrenheit, it was possible to decompose the heavy molecules into lighter molecules with fewer carbon atoms, with the maximum decomposition resulting from fairly prolonged application of heat.[5] The breakdown of the heavy molecules into lighter ones was accompanied, however, by a concurrent phenomenon—namely, the formation of even heavier hydrocarbons and the deposit of solid matter called "coke" or "carbon." Likewise, at the temperatures used the oil boiled, and if the vapors were not released (and they could not be if heat was to be applied for a long period of time), high pressures developed in the still. And as the cracking operation yielded products of increasing volatility, this pressure would, apparently, rise as the reaction progressed.

The engineering problems involved in the reduction of the laboratory knowledge of cracking to commercial practice were formidable, since the pressures and temperatures employed carried severe

[4] See Standard Oil Co. v. United States, 283 U. S. 163, 167.

[5] It has been stated, however, that cracking is an almost instantaneous reaction in the vapor phase processes carried out at temperatures above 950° F. See de Florez, Profits from Cracking in Vapor Phase, XIX National Petroleum News No. 49 (Dec. 7, 1927), pp. 32, 33.

risks of fire and explosion. The first commercial process was introduced about 1913—the so-called Burton process. Burton heated the charge—gas oil—in a simple tank, or shell still. The tank was not continuously fed; a charge of 8250 gallons was pumped into it and brought to a temperature of 700-750° over a period of some 12 hours under autogenous gas pressure of 75 pounds. The cracking operation was then continued for 24 hours. The vapors liberated in the still were conducted through an inclined line to an aerial condenser, where the heavier and less volatile vapors were liquefied and drained back into the still through the same vapor line, there to be mixed with the unvaporized residue and subjected to further cracking. This first fraction of the vapors was called "reflux condensate"; the unliquefied vapors were carried to a second condenser and liquefied as "pressure distillate," a liquid convertible by further refining operations not here relevant to commercial gasoline.

The coke deposited during cracking tended to cause uneven heating of the shell still, with resultant formation of weak spots and danger of explosion. Consequently, it was necessary to shut down the still after about 24 hours of cracking to permit the coke to be cleaned out. The cleaning and pre-heating processes consumed about half the operating time; the gasoline yield ranged only about 25-28% of the gas oil charge; and the menace of explosion was serious. The Burton process was modified and improved somewhat in 1915 by the introduction of the Burton-Clark process, which differed in that it did not apply heat directly to the shell still, but instead circulated the oil in the still by convection through a separate heating coil. This improvement increased the yield to some 30-32%. The Burton-Clark process constituted the general industrial practice at the time of Dubbs' patent.

Chemical engineers in the refining industry were engaged in continuous research looking to the solution of the coking problem and the development of a process which might operate continuously, without wasteful periodic shut-downs of expensive plant equipment. The processes in suit are among the results of their efforts.

Dubbs Patent No. 1,392,629, the alleged infringement of which forms the basis of this action, covers a process first demonstrated in a pilot plant at Independence, Kansas, in 1919. The oil charge is fed through a nest of heated tubes—called "B tubes"—about

four inches in diameter—a heating process not unlike that used in Burton-Clark. The heated oil is then delivered to tubes of about ten inches diameter—"C tubes"—which are only partly filled with liquid oil. The C tubes are insulated, but unheated or only lightly heated to prevent the escape of heat by radiation. Here the vapor generated as the result of heating and cracking passes from the liquid oil and is carried to vapor line condensers of the same general kind used in the Burton system. The first vapors to condense—that is, the reflux condensate—are returned to the B tubes for further heating and cracking; the lighter vapors are carried to a second condenser to become gasoline. The unpavorized residue of liquids and suspended solid particles in the C tubes is continuously withdrawn from the system; thus only the light oils of the reflux condensate, which have but a limited tendency to form coke, are recycled through the B tubes. Such deposit of coke in the lightly heated C tubes as occurs involves no marked danger of explosion, and it precludes clogging of the smaller superheated B tubes. Gas oil subjected to the Dubbs process has been made to yield 40-50% gasoline, and continuous runs of from ten to twenty days are usual.

In the commercial practice of the Dubbs patent, a simple vapor separation tank usually takes the place of the C tubes.

The points of similarity and dissimilarity to the Burton-Clark process are worth noting. Burton-Clark subjected to prolonged heating the unvaporized hydrocarbons as well as the light reflux condensate. Since these heavy hydrocarbons have the greatest tendency to form still heavier oils and to deposit carbon, their withdrawal from the apparatus was an important advance. The continuous feed system of the Dubbs apparatus was also regarded as an improvement on Burton's batch process. Burton-Clark circulated through the heating tubes the heavy oils formed during cracking; Dubbs permitted only a mixture of fresh oil and reflux condensate to pass through his furnace coil.

The Egloff patent covers an improvement on the Dubbs process. As we pointed out at pp. 2-3, *supra*, the initial step in the separation of gasoline from crude oil is fractional distillation; then gas oil, the fraction next below gasoline and kerosene, is subjected to cracking in a special apparatus. The fuel oil fraction has such a strong tendency to form very heavy hydrocarbons and coke that it is undesirable as a charge for the high-temperature heating coil

in the cracking systems.[6] What Egloff proposed was a relatively mild heating of the heavy oils in a separate furnace—thus fuel oil or topped crude might be used as a charge. The temperature and pressure would be sufficient to occasion a mild cracking; the vapors might then be delivered to the same vapor separation tank used with the high temperature heating tubes, and the reflux condensate from these vapors might be used as the charge for the high temperature tubes. The substantial effect is to subject fuel oil or topped crude, from which the charge for a Dubbs plant was often separated by separate distillation, to a distillation and mild cracking operation, using the vapor separating tank and the condenser apparatus of the Dubbs plant instead of using separate apparatus to prepare the Dubbs charge.

The apparatus of respondent's Winkler-Koch process closely resembles the apparatus of the Dubbs-Egloff system. Oil is heated in either the high-temperature or low-temperature furnace, depending on the kind of oil used; the heated oil is delivered to a vapor separation tank; the reflux condensate flows back to the high-temperature coil for further cracking.

The differences between the processes, as distinguished from the apparatus, are more marked. Dubbs taught the heating of the oil charge in the B tubes "without substantial vaporization." Thus the illustrative run in the patent suggests the heating of oil to a temperature of 750° to 860° F., with a pressure of about 100 pounds to the square inch, resulting from vaporization, maintained in both B and C tubes. In the respondent's process, oil enters the heating coils at a temperature of 590° and leaves at a temperature of 940°; a pressure of 500 pounds to the square inch is maintained in the heating coil. Some 85% of the oil by weight and 95% by volume reaches a vapor phase in the heating coils. The oil in mixed liquid and vapor phase enters the vapor separation tank through a pressure reduction valve, so that the pressure in the tank is 26 pounds as compared to the 500 pounds of the heating coil.

The courts below believed that these differences were sufficient to prevent the respondent's process from infringing the claims of the Dubbs patent. A typical claim is Claim 5, as follows:

[6] Fuel oil can be directly charged to a Dubbs system; but the run must be greatly shortened.

"5. A continuous process for cracking hydrocarbons consisting in passing the same in a stream in an advancing direction from an inlet point to a discharge point separated and entirely disassociated from the inlet point, subjecting the material in the first stage of its travel to a cracking temperature while preventing substantial vaporization, affording a vaporization space above the stream during the second stage of the travel thereof to said discharge point, taking off the vapors from said vapor space and subjecting them to a condensing action, discharging into the stream at a point remote from that where vaporization occurs a portion of the condensates and maintaining a vapor pressure on the material under treatment during distillation and condensation."

It is apparent that the issue of infringement of the Dubbs patent turns on the construction to be given the words, "without substantial vaporization," as they are used in the claim. The petitioner argues that what is claimed is that there is no release of vapors from the liquid in the B tubes; the respondent argues that it is meant that no liquid oil passes into a vapor phase in the B tubes, that is, that there is no vapor generation in the B tubes.

Either construction would be consistent with the operation of a cracking process. By applying sufficient pressure, it is possible to prevent the generation of vapor from oil even at the relatively high cracking temperatures. The gasoline yielded by cracking oil in liquid phase is chemically different from that yielded by vapor phase cracking, and at the date of the patent, the liquid phase product was preferred. The yield of vapor cracking was a malodorous yellow mixture requiring additional refining operations to make it marketable; however, since 1919 gasoline formed by vapor cracking has become more highly regarded because of its superior antiknock characteristics.

The parties are wholly at odds as to the nature of the process taught by Dubbs in his patent specifications. The petitioner contends that cracking takes place in the B tubes with resultant generation of vapor, and that in the C tubes the vapor is merely set free from the liquid oil. The respondent argues that the only function of the B tubes is to furnish enough heat to cause cracking, and that the oil actually cracks while it is in the C tubes. The cracking process, it will be remembered, requires that the oil be kept at a high temperature for some time if substantial gasoline is to be formed, and the respondent compares the process taught by Dubbs to the familiar fireless cooker, in which a vessel with

heat-keeping qualities is first heated and then removed from the flame while cooking goes on with the heat first supplied.

The patent several times refers to the B tubes as "cracking tubes" or as the "cracking zone." In its relevant parts, the patent describes the process in the following terms:

"Describing the operation of the process, the material to be treated is drawn from any suitable source by means of the pump J' and discharged therefrom through line J' into and through tubes B and during the time they (*sic*) are passing through said tubes, they (*sic*) are subjected to sufficient heat to cause the desired amount of cracking. Said oil is then passed into the tubes C which are only partially filled with the oil and as the oil passes through these tubes, there is a liberation of vapors from same and which vapors pass up through the vapor tubes D, E. . . .

"A light fire may be maintained under the tubes C as shown in the drawings or said tubes may be heavily insulated . . . to prevent loss of heat by radiation and thereby dispense with the fire under the tubes C . . . The per cent. of vapors generated from the oil as it passes through the tubes C will depend on the amount of heat acquired by said oil while passing through the 4" coils."

The petitioner refers, also, to Claim 5, which specifies "a vaporization space above the stream" in the C tubes. These words, we are told, must necessarily refer to a space in which vapors are released, not generated. This does not advance petitioner's argument, however, as the space referred to, as shown by the subsequent words of Claim 5, is simply space to hold released vapor, that is: "vapor space." Neither vapor separation nor vapor generation taker place in the space above the stream.

Respondent too supports its argument that not even generation of vapors was envisaged by the Dubbs patent limitation against "substantial vaporization" by reference to the patent. It points out that as the patent does not define "vaporization," the word is used in the accepted sense of chemical nomenclature. The use of the word "vaporization" in the patent to show what takes place in the C coils is stressed by respondent as indicative of the meaning with which the word was used by Dubbs.[7] The respondent says this means generation as well as release of vapors because the patent says, "The per cent of vapors generated from the oil as it passes through the tubes C will depend on the amount of heat

[7] "The heated oil then passes to the 10 inch C coils which are maintained about half full of oil and wherein vaporization takes place."

acquired by said oil while passing through the 4" [B] coils." It is said that the patent consistently describes the charge in the B tubes as "oil," and never as vapor or mixed oil and vapor or foam.

The petitioner argues that the reading of the patent which respondent asks would result in an inoperative process under the conditions of the illustrative run. It seems to be conceded that oil heated to 750° at 100 pounds pressure would not vaporize, but in order for cracking to take place in the C tubes, it would be necessary to furnish some additional heat to replace that consumed in the cracking reaction. At the higher temperatures suggested in the illustrative run, much higher pressures than the 100 pounds called for become necessary to preclude vaporization, although the heated oil would, in cooling from the higher temperatures, provide the heat necessary for the cracking reaction in the C tubes. But even though experimentation at low pressures would show generation of vapor in the B tubes, this will not control the language of the claim.

We agree with respondent's position as to the teaching of the patent. We are of the view that "without substantial vaporization" as used in the patent means that the generation and release of vapors in the B tubes is to be avoided so that the charge will enter the C tubes for cracking as nearly as may be in the liquid phase. It clearly appears from the history of Dubbs' application in the Patent Office that the use of the phrase was purposeful. It was inserted after the Patent Office had disallowed claims without the phrase and it was evidently added to clarify the description of the steps of the process and the claims of novelty. Cf. *Exhibit Supply Co.* v. *Ace Corp.*, 315 U. S. 126, 136. The importance is evident from the history of the trade since, as pointed out above, at the time of Dubbs' application gasoline obtained by cracking the charge in liquid phase was more desirable than the gasoline obtained from vapor phase cracking.[8]

The distinction made by the controverted phrase is of practical importance. Dubbs patented a process for converting hydrocarbons through cracking. The difficulty in the prior art was carbon deposit or coking. If in this process the cracking operation is pressed to substantial completion in the B tubes, the patent seems

[8] But see Universal Oil Products v. Globe Oil & Refining Co., 40 F. Supp. 975; 137 F. 2d 3.

to fail to teach a method of preventing coking in those tubes. Coke there will certainly be as a result of the cracking; what would prevent its deposit? It may be possible to prevent the deposit of carbon by maintaining a rapid turbulent flow; indeed, we are told that this is the device used in the commercial application of both parties' processes, and Behimer, another engineer working in the cracking field, attributed the failure of a similar apparatus (see Patent No. 1,883,850) to the want of a pump of sufficiently high pressure to maintain the necessary velocity of flow. But the patent, while it calls for a pump to inject the charge into the B tubes, does not point out the need of using rapid flow for this purpose; the pressure within the apparatus is expressly referred solely to vaporization. One building a device according to Dubbs' teaching might, if he read the patent as teaching that cracking was to occur in the B tubes, content himself with using relatively short B tubes and a correspondingly slow flow to furnish cracking time. That procedure would presumably lead to coking; the patent, however, does not describe how that result may be avoided.

There is a reason of controlling importance why the protection of the Dubbs patent must be limited to a process in which cracking takes place largely in the C tubes.

As a reward for inventions and to encourage their disclosure, the United States offers a seventeen-year monopoly to an inventor who refrains from keeping his invention a trade secret. But the *quid pro quo* is disclosure of a process or device in sufficient detail to enable one skilled in the art to practice the invention once the period of the monopoly has expired; and the same precision of disclosure is likewise essential to warn the industry concerned of the precise scope of the monopoly asserted. *Béné* v. *Jeantet*, 129 U. S. 683, 685-86; *General Electric Co.* v. *Wabash Corp.*, 304 U. S. 364, 368.

In a process patent in the refining of oil, preciseness of description is essential. It is a crowded art. Hope for success for new patented processes with slight variations from those in use caused large expenditures in testing their efficiency by important companies with staffs of specialists who were skilled in the art. Among the processes cited to us as prior art advances on Burton-Clark, those of Hall Patent No. 1,175,910, Alexander Patent No. 1,407,619, and Behimer Patent No. 1,883,850 were embodied in experimental plants, and the testimony is replete with references to such other

contemporary experimental or working cracking systems as the Holmes-Manley, Fleming, and Cross processes. The claim is the measure of the grant. *Smith* v. *Snow*, 294 U. S. 1, 11. The claim is required to be specific for the very purpose of protecting the public against extension of the scope of the patent. *White* v. *Dunbar*, 119 U. S. 47, 52; *Minerals Separation* v. *Butte & Min'g Co.*, 250 U. S. 336, 347; *Knick* v. *Bowes "Seal Fast" Corporation*, 25 F. 2d 442, 443. The applicants for the patent thought the phrase "without substantial vaporization" in the B tubes important. While varying the details of a process does not avoid infringement, *Tilghman* v. *Proctor*, 102 U. S. 707, when the accused process does not substantially follow the mode taught in the patent, there is no infringement. In view of the importance of the direction as to the non-generation of vapors in the B tubes, as hereinbefore pointed out, we do not think a process which relies on vaporization in the B tubes can be said to infringe the patented process.

The Egloff patent does not require extended consideration. It may fairly be said that the Egloff patent, described above at pp. 5-6, was an improvement on the Dubbs system. The improvement consisted in providing a clean charging stock for the B tubes by heating crude or fuel oil in coils which are contained in a separate heating apparatus from the one used to heat the cleaned stock, and discharging it in a liquid phase into an expansion chamber. The unvaporized oil is withdrawn from the expansion chamber and does not reenter the system. The vapor is liquefied in a partial condenser or dephlegmator, and the reflux condensate is pumped as a charge into the B tubes of apparatus substantially similar in form and operation to the Dubbs patent. The reflux condensate after passing through the B coils reenters the same expansion chamber that is used for its preparation.[9] Nothing is said in the Egloff patent as to vaporization in the B tubes.

[9] A typical claim (5) reads as follows:

"5. A process of oil conversion, consisting in maintaining a body of heated hydrocarbons in an enlarged zone where substantial vaporization occurs, in subjecting the vapors to reflux condensation to condense the heavier vapors, in passing the reflux condensate in an advancing stream through a heating zone where it is subjected to cracking conditions of temperature and pressure, in delivering heated condensate to said enlarged zone, and simultaneously heating an independent stream of charging oil for delivery to said enlarged zone to a temperature sufficient to cause a substantial vaporization thereof in said zone, in introducing said heated charging oil to the enlarged zone, and in withdrawing unvaporized oil from said enlarged zone without permitting the same to again enter either of said oil streams."

It seems obvious that the Dubbs patent anticipated all the steps of the process except the separate treatment of the heavy oil. The clean charge of the reflux condensate was brought about by the withdrawal of the residue of unvaporized oil, and this withdrawal was old in the art.[10] As there is nothing in the claims or specification to show any reliance upon where vaporization, whether by generation or liberation, takes place, such difference as there may be between this patent and Dubbs as to that phenomenon is not significant. But we see nothing in the addition of the extra still that involves invention. In retrospect, it appears almost inevitable that once a satisfactory continuous feed cracking apparatus was developed, chemical engineers would promptly design equipment for integrating the initial distillation of crude or fuel oil, with whatever cracking might be practicable, with the gas oil cracking process to form a continuous operation. Retrospective simplicity is often a misleading test of invention where it appears that the patentee's conception in fact solved a recognized problem that had baffled the contemporary art; but in this case Egloff advanced his improvement shortly after Dubbs disclosed the underlying process and before Dubbs' system had had wide commercial use; hence contemporary workers had no occasion to deal with whatever engineering problems might have been involved. We have, therefore, a conception which is on its face too obvious to constitute patentable invention, and which was advanced shortly after any need of it arose. We think the district court was right in finding the Egloff patent invalid.

Affirmed.

[10] Egloff was not the first patentee to realize the advisability of withdrawing the heavier oils; Dubbs certainly anticipated him, as did Behimer, No. 1,883,850; Greenstreet, No. 1,740,691; Alexander, No. 1,407,619; and Hall, No. 1,175,910.